Alternative Centerline Pipe Backfill Details Installation & Evaluation

ND Highway 127 from Fairmount to Wahpeton

Jeff Jirava, P.E.
North Dakota Department of Transportation

Purpose and Need

The purpose of this evaluation is to determine the factors behind the occurrences of a rough riding pavement in the form of dips or abrupt changes of the roadway profile above and adjacent to centerline pipes.

Objective

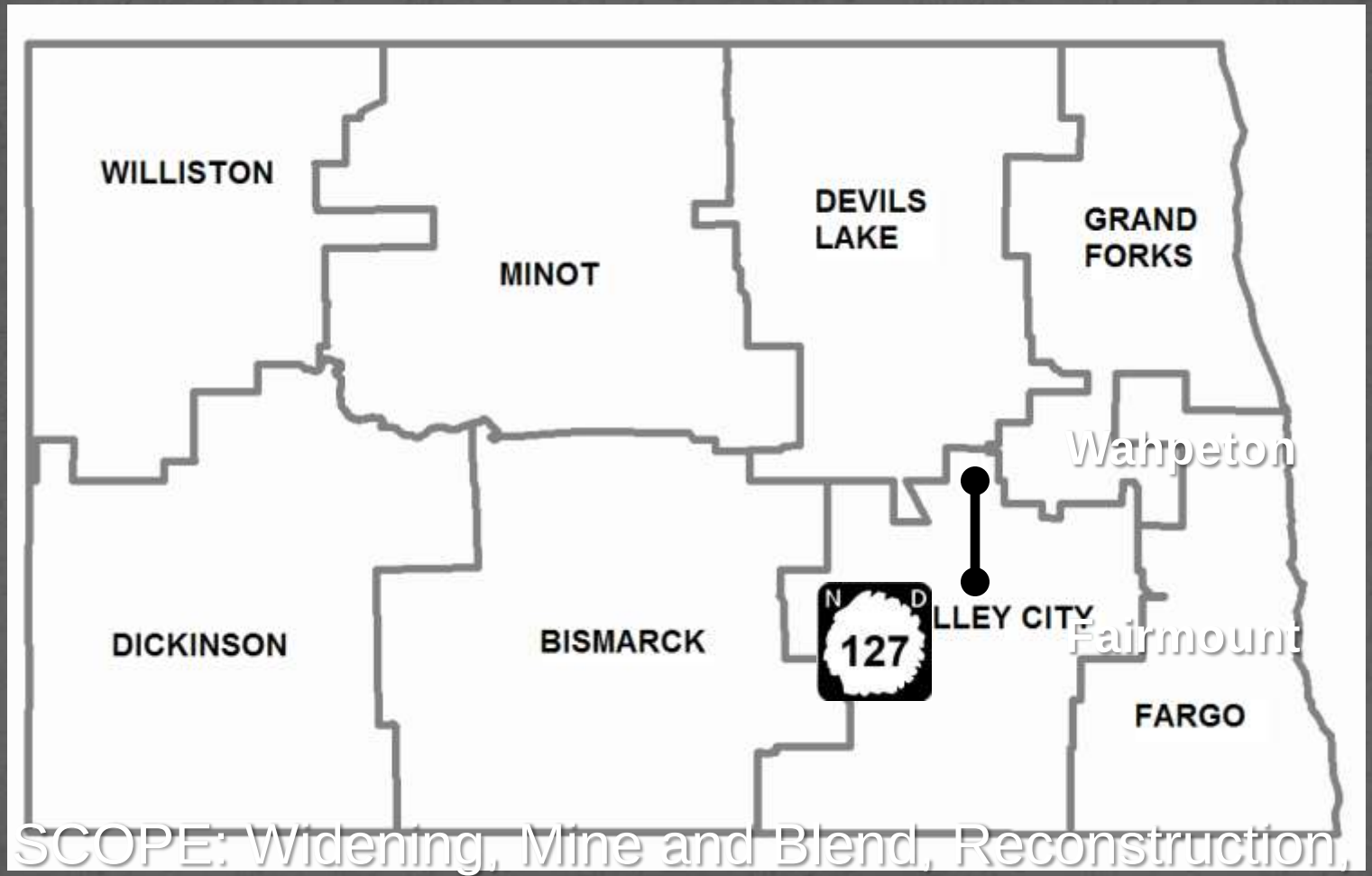
The objective of this study is to try and identify a specific factor or component of the pipe installation that causes undesirable results.

- Design
- Construction
- Evaluation

Materials & Research Involvement

- Offer an objective evaluation of the performance of 11 different centerline pipe backfill details that were developed by the NDDOT Office of Project Development and the Fargo District
- Provide an on site evaluation of the installation of each backfill detail
- Provide follow up monitoring of each backfill detail

Project Location & Scope



SCOPE: Widening, Mine and Blend, Reconstruction, Hot Bituminous Pavement and Incidentals

Design

The following are the factors that were addressed in the design phase:

- Pipe Materials – Concrete & Metal
- Backfill Material – Aggregate, Native & CDF
- Subgrade Transitioning
- Bedding Thickness
- Geotextile Fabric

Pipe Materials

Reinforced Concrete Pipe

- Consisted of 7 Backfill Details
- Pipes were tied, sealed and wrapped
- Ranged in size from 24” to 30”

Placed Concrete Pipe

Design

Pipe Materials

Metal Pipe – Alternative Pipe Policy

Polymeric Coated Steel – Spiral Ribbed

- Consisted of 4 Backfill Details
- Placed in two sections and connected with bands
- Ranged in size from 24” to 30”

Placed Metal Pipe

Design

Backfill Materials

Aggregate

- Moisture & Density Controls
  - 90% of AASHTO T180
  - 6” compacted lifts
  - Testing every 1’ of compacted aggregate

Adding Water to Aggregate

Design

Backfill Materials

Native Material (Clay)

- Moisture and Density Controls
  - 95% of AASHTO T99
  - 6” compacted lifts
  - Testing every 1’ of compacted native material

Compaction of Native Material

Design

Backfill Materials

Control Density Backfill

- Mix design specified in plan note

Component	Amount/CY
Cement	100 lbs
Fly Ash	300 lbs
Fine Aggr.	2,600 lbs
Water	70 Gallons

- One side of the roadway per day
- Had to sit a minimum of 6 hours before covering

Design

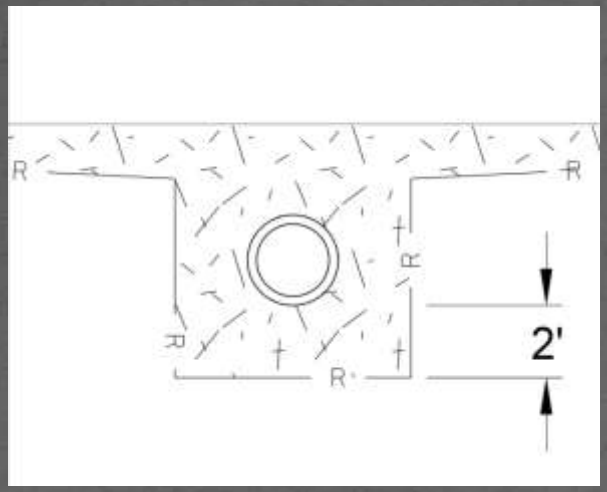
Subgrade Transitioning

20.1 Subgrade Transition
(Current Standard)

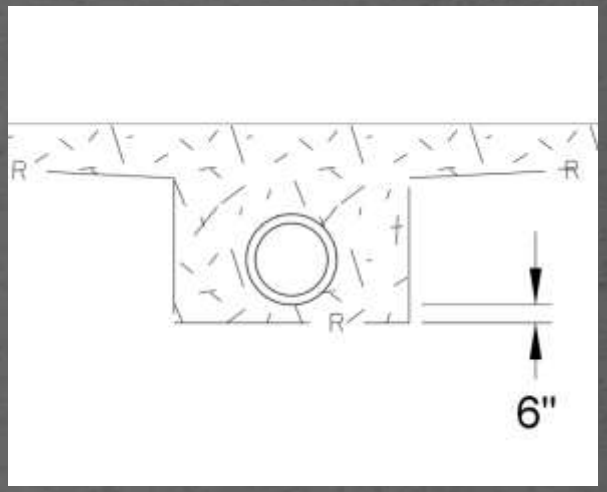
Design

Bedding Thickness

2’ of Aggregate Bedding (Current Standard)



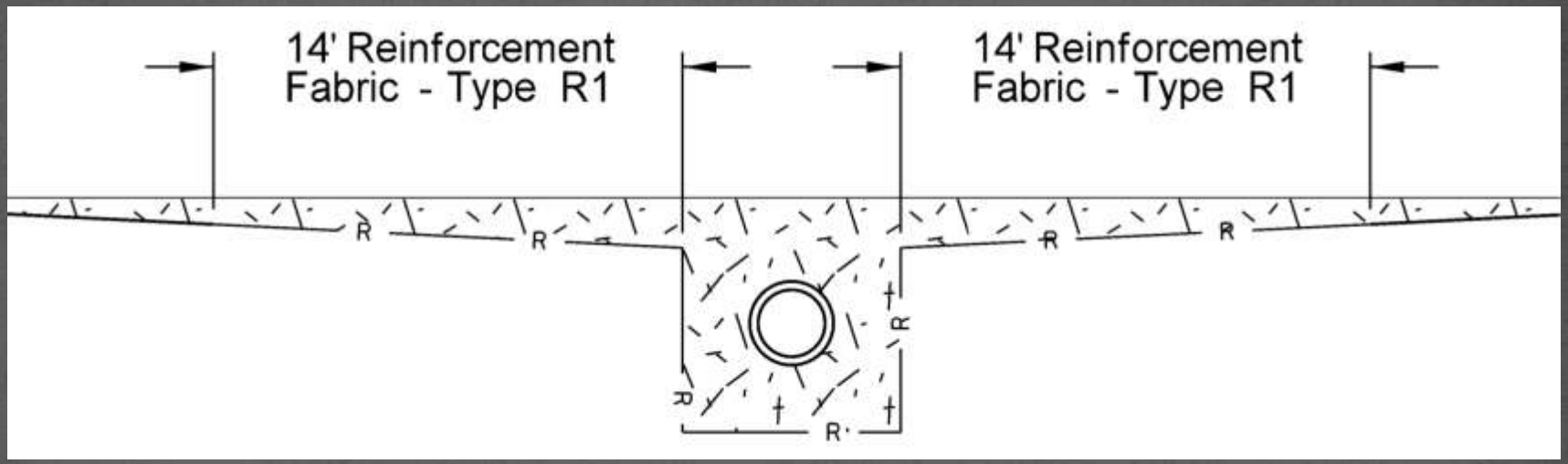
6” of Aggregate Bedding



Design

Geotextile Fabric

- The current standard is for Geotextile reinforcement 14’ on the subgrade transitions



(Current Standard)

Construction

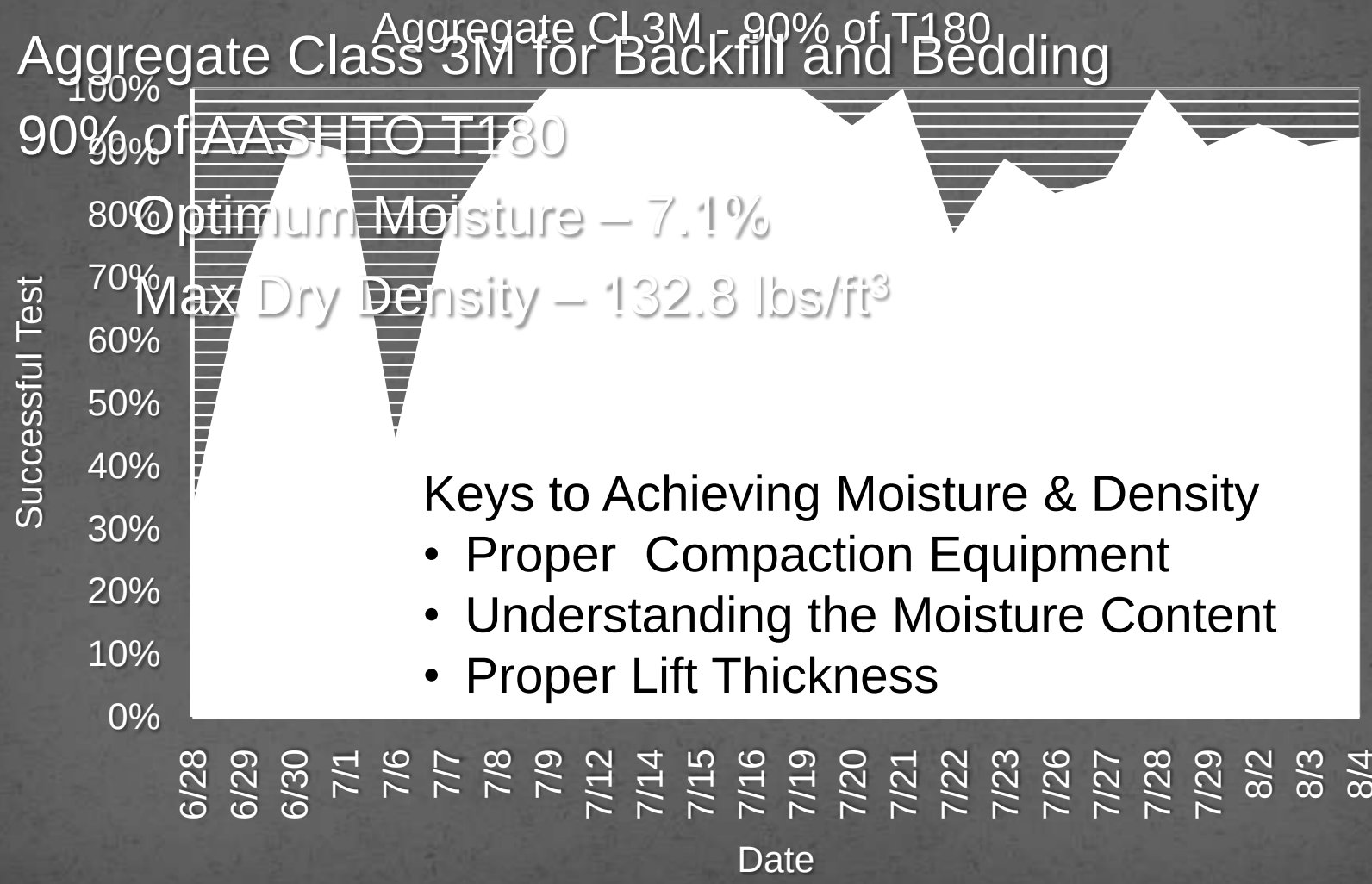
The following were factors that were evaluated with the installation of pipe:

- Density and Moisture Specifications
- Constructability of the Details

Construction

Moisture and Density Controls

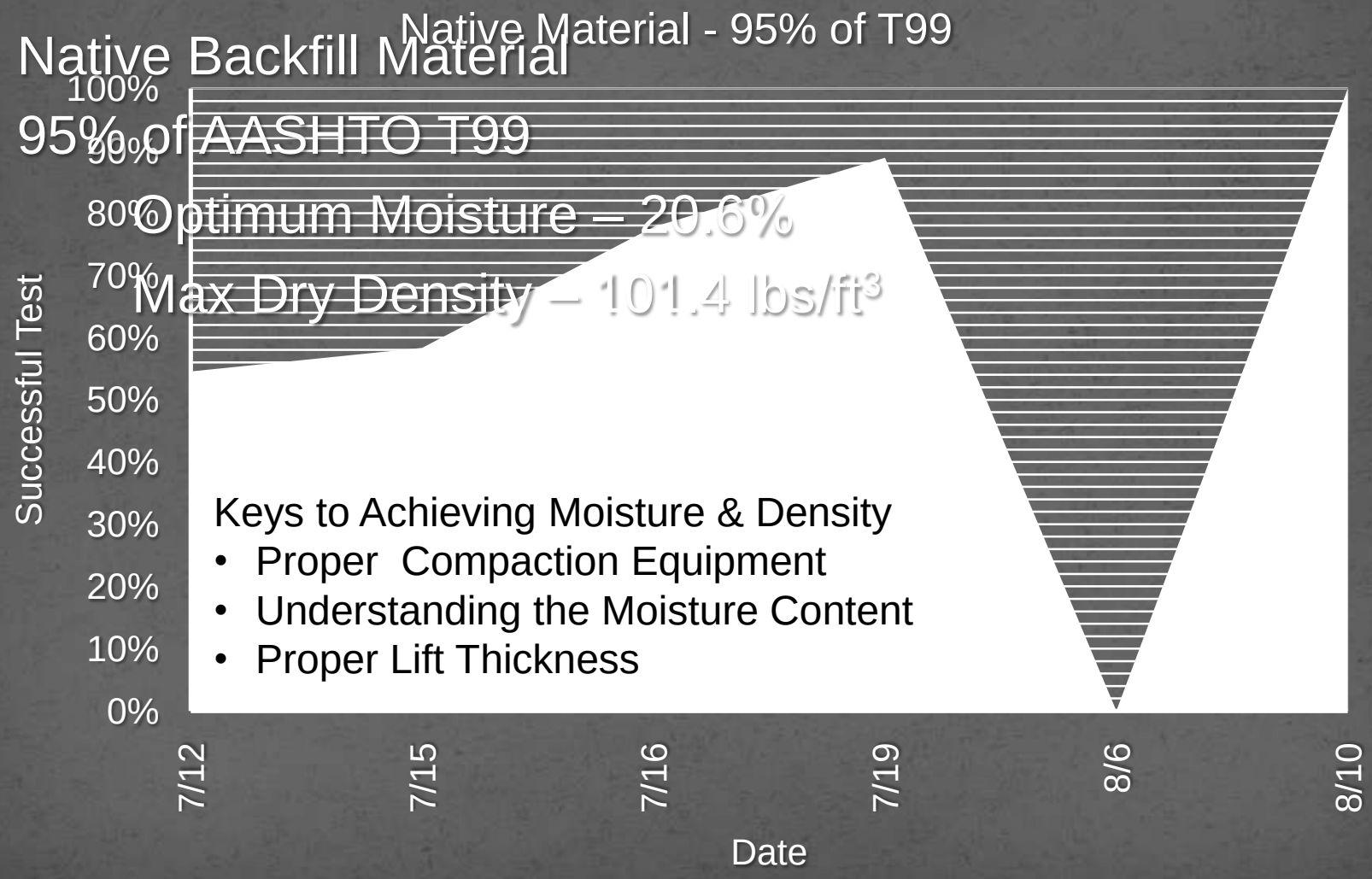
- Aggregate Class 3M for Backfill and Bedding
- 90% of AASHTO T180



Construction

Moisture and Density Controls

- Native Backfill Material
- 95% of AASHTO T99
  - Optimum Moisture – 20.6%
  - Max Dry Density – 101.4 lbs/ft^3



Keys to Achieving Moisture & Density

- Proper Compaction Equipment
- Understanding the Moisture Content
- Proper Lift Thickness

Construction

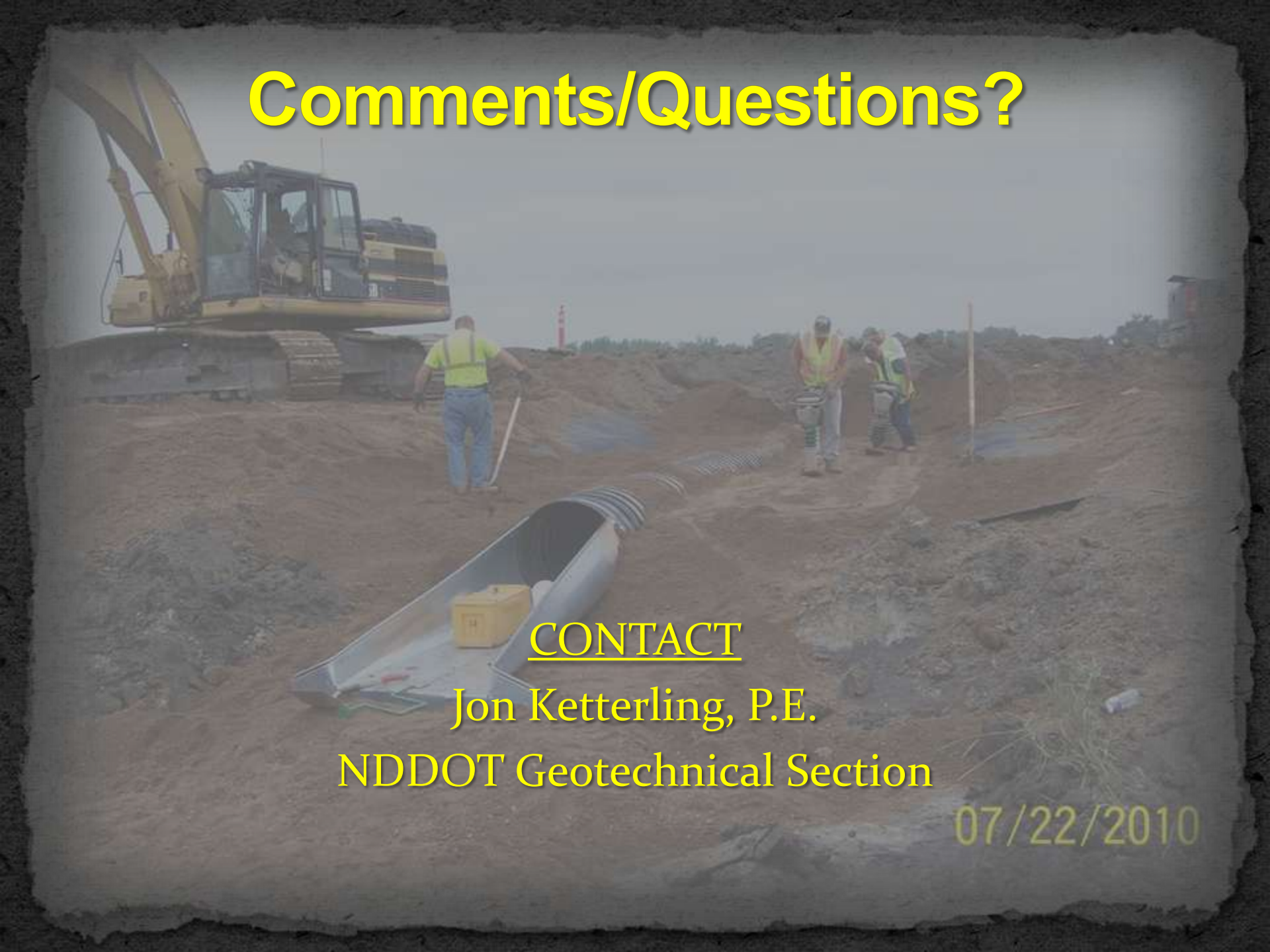
Constructability of Details

- The pipes were installed under traffic one side at a time which required twice the amount of tests for moisture and density
- The aggregate backfill material was easier to obtain a more consistent product in regards to moisture and density
- Aggregate was also easier to work and manipulate (i.e. didn't have clumps and could get under the haunches of the pipe)

Evaluation

- Frequency: 3 times per year for a minimum of 3 years
- Methods: Visual, Physical Survey & High Speed Profiler
- Reporting: Yearly

Comments/Questions?



CONTACT

Jon Ketterling, P.E.

NDDOT Geotechnical Section